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REPORT

—ON—

YAKOUN COAL FIELDS, GRAHAM ISLAND, QUEEN CHARLOTTE DISTRICT.

Victoria, B. C., October, 1892.

MR. WM. WILSON,

SIR,—As per instructions received from you, I left Victoria by steamer, the evening of the 16th of March, with a party consisting of Mr. Robertson, myself, four white men and four Japanese to explore and develop properties belonging to you, Mr. Robertson and others, on Graham Island, Queen Charlotte Group, for coal.

We arrived at Skidegate, Graham Island, midday on Saturday, the 19th of March, and remained there over Sunday. On the 21st of March we obtained a large canoe and five Indians, and moved to the mouth of the Honna river, about four miles from Skidegate, where we camped for the night. The following morning we started for Camp Robertson, which is on Section 20, Township 5, where the coal outcrop discovered by Mr. Robertson is situated.

The trail from the mouth of the Honna follows the river north for $3\frac{1}{2}$ miles; it then leaves the valley and strikes north-west along the flank of a range of hills for $4\frac{1}{2}$ miles, making the distance of Camp Robertson from the mouth of the Honna river about 8 miles. The formation along the trail is sand-stone; the only exception being at the highest point on the hills, where we met with Conglomerate.

To place Camp Robertson in condition for work took us until the end of the month.

Mr Robertson here gave me the following instructions:—

"You will use every effort to explore and develop the most easy and what will appear in your best judgment the best coal seams included in what is shown to you on the sketch map of that part of Graham Island, Queen Charlotte Island District, marked inside the red lines. You will thoroughly explore the different sections for other outcroppings, besides those already discovered, and when you have good reason to believe coal can be found with your present party's labor, you will do so if your other work will permit, but develop the best and most easy first.

"Also examine the most advantageous route for a Railway from the coal fields to the nearest and best shipping point, including the Skidegate Inlet and Rennel's Sound.

"Report on coal and formation, timber, soil and every item of information that may be interesting to capitalists who may be inclined to invest in or purchase the property.

"Keep a record of all work done and the men employed on the different points of the work, and return same with your general report; also account of men's time and their accounts.

(Signed) W. A. ROBERTSON,

"for self and other proprietors of the land in question."

I have carried out the above instructions as fully as possible with the number of men at my disposal. I now report upon the result of the season's work:

COAL DEVELOPMENTS.

Camp Robertson.—On Section 20, Township 5, I opened first on Yakoun bed No. 1, which was discovered by Mr. Robertson. It was 19 feet in thickness, as shown by the columnar sections. This bed on the surface is vertical. I sank a shaft 7 x 7 feet to a depth of 23 feet, and found the bed gradually lightening off in dip. At the foot of the shaft the dip to the east was about five degrees only. I then started a gangway at about 17 feet from the surface, going east. I drove this 26 feet, and at the bottom wall the dip was 60° degrees east, the general strike north and south.

This coal, as we got under cover improved in quality, and is, in my opinion, as fine a coking coal as the Connellsville bed of Pennsylvania.

It was tried by Mr. Robertson for smithing, and he pronounced it equal to Cumberland. About 60 feet east of this shaft (Number 1) I discovered an outcrop of another bed, which overlies No. 1. This I sank upon and found it, at the surface between 13 and 14 feet thick, as you will see on columnar sections. At the foot of this shaft (Number 2) 14 feet in depth, I drove across heading north 9 feet, where I struck the hanging wall, and then drove east along this wall 12 feet, and found the bed increased to 14 feet 8 inches, the upper bench increasing from 3 feet to 5 feet 7 inches. East of this shaft I drove a drift in the same bed, but abandoned it on account of the top, which would have required heavy timbering and caused some delay.

I then followed the line of crop about 40 feet east, and opened a slope on the same bed, and drove it about 12 feet on the dip and 12 feet east on a level. This bed No. 2 is of similar quality to that marked No. 1, but not so free from impurities. Going further east about 120 feet, down the south-east fork of the Yakoun river, which is hereabout 12 feet wide, I started a tunnel, intending to strike bed No. 1 again. After driving 89 feet, not having found coal, I began to think the bed was underneath the tunnel, so came back and sank a proving shaft, marked No. 3 on the plan, and at 4 feet from the surface struck coal. I uncovered the bed and found it to be 7½ feet in thickness, a clean bed of coal from wall to wall. This is somewhat of a freer burner than Nos. 1 and 2, but still a good coking coal. I came to the conclusion that it was another bed overlaying No. 2.

Upon going back to examine the slope before mentioned, I found that about 8 feet above the hanging wall there were strong indications of another bed. Upon investigation I found the crop of bed No. 3 on the top of the slope, and this corresponded with the bed as shown in shaft No. 3.

I then went further up the hill to the east and sank shaft No. 4 to a depth of 13 feet 8 inches and found the same bed again. You will see by reference to plans and cross-sections that on continuing the tunnel about 14 feet I would have cut this bed, but the tunnel is on top of beds Nos. 1 and 2.

At the mouth of the slope the formation shows an anticlinal which evidently throws the coal in again on the south side of Yakoun creek and underlays the property south.

Camp Anthracite.—On Section 17, Township 5, I started this camp on the 23rd of April,

After having finished the cabin we commenced work on an outcrop and drove in a tunnel about 40 feet. I found the measures somewhat disturbed, showing that it would be necessary to sink in order to get the bed in good condition. I started a shaft, on the bed, close to the mouth of tunnel and sank it to a depth of 39 feet. The condition of the bed was not altogether satisfactory, but still it was in very fair shape. Samples are in your possession of what was taken from this shaft. On account of not having the appliances at hand to sink deeper, I started the men to drive in on one of the benches cut in the tunnel to the east along the wall. When we had driven 30 feet the seam had increased from 2 feet at the entrance to 10 feet at the face. There is little doubt, in my mind, that if the shaft were sunk to a greater depth, the bed would be found in excellent condition.

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The strike is regular and the dip decreases from vertical on the surface to about 45 degrees at the foot of the shaft. It shows in the tunnel to be 16 feet between the walls. The coal from here can be taken, as shown by the plan, down the creek until it meets the Yakoun river, and then along the Yakoun river to meet the road from the tunnel driven east of Camp Robertson.

Camp Wilson.—On the 2nd day of June I started with a party of two white men and one Jap for Camp Wilson to open up the bed of coal known to outcrop on Section 36, Township 9, about 9 miles north of Camp Robertson by trail. When discovered a drift was driven about 40 feet north on the bed, which ran into a gravel wash. It was very plain to see that it was an error of judgment to have ever started this drift, as the entire hill is a surface wash, the measures standing on end and the drift one half in coal and one half in gravel, as shown on the cross-section. As soon as I saw it I knew a mistake had been made, so at once started a shaft at the mouth of the old drift.

The bed was vertical at the surface, but at 17 feet the dip began to change. I then drove south about 23 feet. The bed increased from 13 feet 8 inches on the surface to 17 feet 8 inches at the face, with one bench of 14 feet of clear coal.

At the face the dip had fallen off to about 60 degrees east, the strike continuing north and south. I then drove north about 20 feet and cross-sectioned directly underneath the point at which it was cross-sectioned previously and found the bed had increased to 18 feet with one bench of 15 feet 10 inches of clean coal without a parting of any kind.

At this point the dip had flattened to 50 degrees east still continuing the general strike of north and south.

This coal is of a later formation than that found at Camp Robertson.

It is a free burning bituminous coal of excellent quality, and burns with a clear flame, leaving a very small percentage of ash, and requires but little draft. In my opinion it is superior for domestic use to any coal being mined to-day on the Pacific Coast. After having thoroughly satisfied myself that the measures were regular and the strike kept its course of north and south, I started to open up on a small outcropping about half a mile to the north-west of the large bed I had been working. This outcrop is about 200 feet south of the north-west corner post of section 36, township 8. This bed showed one foot on the surface in a small creek. At the depth of four feet it increased to 2 feet 6 inches. Owing to the water from the creek and lack of pumping facilities I was unable to sink deeper. The coal is of similar quality to that found at Camp Wilson, but is a bed underlying it.

CONDITIONS OF THE MEASURES AND COAL OUTCROPS.

From exposures and working it is evident that once we get below the surface the formations are regular and broken at no point. They flatten off with depth and take a moderate dip to the east and north-east.

Your property is well to the east of the volcanic eruptions which have broken up the measures on the south-west shore of Skidegate Inlet and the west coast of the Island. One of the strongest indications I could find of the measures flattening as we get under cover, is on the creek about one mile south of Camp Robertson, and one-half mile east of the trail. At this point there is a water fall with a drop of about 80 feet over a fine grained blue sand stone formation, lying in seams about two feet in thickness. The upper seams have a heavy dip which gradually lightens off until at the bottom the dip is very slight towards the east. This is the largest exposure I could find on the property.

Another strong indication is the tunnel I drove at Camp Robertson.

You will notice on the plan that this starts on a level with the Yakoun River and is driven towards the east into the hill a distance of 89 feet. The face is underneath the plateau upon which Camp Robertson is situated. The measures cut, dip about five degrees east, and at all the openings

that were made show the dip to be heavy at the surface and gradually flattening as they get under cover. All the exposures I could find show there are no serious eruptions east of the mountains of the west coast and certainly none on the property I explored. I examined as thoroughly as possible the entire property contained in the red lines of the blue print furnished me.

Leaving the mouth of the Honna River and going north we keep in the shale and sandstone formations, until we reach the top of a mountain (height 1200 feet) four miles from the coast, here there is an exposure of coarse pebbly conglomerate, the only conglomerate exposure I found east of the west coast. From here we ascended geologically into the coarse sandstones of the anthracite formation and found the first outcrop on Section 17, where openings were made. About 200 feet up the creek from the tunnel at Camp Anthracite there is another outcrop, but I was unable to get the walls on account of the surface wash and could not spare the men to develop it. From here we still go north, gradually leaving the coarse sandstones, and get into the sand shales and finer sandstones of the other bituminous formations.

The first outcrops found were on Section 20 (Camp Robertson). Here, besides the beds I developed, I discovered coal washings up the creek about 700 yards west of Shaft No. 1. About 500 feet down the creek from the tunnel I found a bed of 8 feet in thickness. This shows a number of sandstone partings I had no time to open it up.

I put a shot in one bench that measured 12 inches in the creek, and at the bottom of the hole it had increased to 16 inches. All these coals are of the oldest bituminous formation, and they are rich in carbon and excellent gas, smithing and coking coals.

About 8 miles further north on Section 36 (Camp Wilson), we get into the darker shales and lighter fine sandstones of the later bituminous formation.

Here I developed two beds, as shown on the columnar sections. The coal is an excellent free burning bituminous; has a large percentage of carbon, and is a good smithing and coking coal. I also discovered another bed in the creek, about 200 feet above the large bed, showing 10 feet of clean coal between the walls. Coming south east from Camp Wilson to a creek on the north west quarter of Section 17, Township 6, I found an exposure of green sandstone, through which were small seams of coal. Following up this stream I met with sandstones and fire clay, similar to those at Camp Wilson, indicating that the beds at Camp Wilson are near to the surface at this point. I also discovered an outcropping of bituminous coal in the Yakoun river on Section 23, Township 9. The exposures here resemble closely those at Camp Robertson, showing that the beds at Camp Robertson are underneath those at Camp Wilson.

Lignites.—Off your property, and about a mile to the north-east, lignites make their appearance and these extend to the north and east coast.

Mr. Robertson informs me that when prospecting on the east coast and, also at Massett, he came upon several beds of lignite. This confirms the statement of Professor Dawson, to which you have called my attention, that "Tertiary rocks holding lignite form a large portion of the northern portion of the Queen Charlotte Islands."

From the great thickness of the bituminous coal bearing sandstones in the interior of Graham Island they must lay at such a depth on the north and east coasts as to be unworkable.

It is evident that the volcanic eruption of the mountain range of the west and south west coasts has raised the measures bearing anthracite and bituminous coals, badly breaking them up in the mountains and bringing them to the surface in the flanks of the foothills which skirt the west and south portions of your property. As the strike is north and south and your property which extends north and south for $11 \frac{1}{2}$ miles, is just north and east of the destructive eruptive forces, there is no doubt in my mind but that the anthracite and bituminous beds will be found either at or not much below the surface over the greater portion of your property and also in almost undisturbed condition.

A brief description of the interior of Graham Island, as viewed from the summit of Mt. Ethelene, situated south of your property, on Section 7, Township 4, together with the map herewith, which contains the result of the summer's explorations of every section which I was instructed to examine, will give you a general idea of its topographical features.

This mountain attains an altitude of 2500 feet above tide and from the summit, the day being clear when Mr. Robertson and I ascended it, we gained a better idea of the topography of the surrounding country than we could have obtained in any other way. Looking north we traced the valley of the Yakoun river from its source to Masset Inlet. We could also locate the divide of the Yakoun and the Honna rivers at an elevation of 275 feet above tide. At this point the waters of the creek on Section 20, Township 5, divide and flow both north and south at high water. We could also trace the valley of the Honna to its mouth and see that a railway could be easily built with a light grade by following this valley to the salt water at Skidegate Inlet. The two plateaus, namely: that at Camp Robertson and that at Camp Wilson, separated by a wide valley, were very distinct.

The opinion I formed from subsequent examinations of these plateaus, was that they are not upheavals, but that the intervening valley has been worn down by the action of water.

They evidently were at one time covered with water, as the gravel under the surface shows, and later became islands and retained their present shape and altitude during the period the changes were taking place in the country surrounding them.

Looking to the north and north-east the entire country to the salt water was in our view showing a gently undulating forest covered surface. South of Mount Ethelene and to the Honna river are mountains from 2000 to 3500 feet in height, which skirt the shore of Skidegate Inlet and extend back into the Island four or five miles. These mountains join a higher more massive and rugged range which runs north along the west coast as far as the eye can reach. With its foot hills it seems almost to fill up the whole of the west portion of the Island from the Pacific Ocean to within one mile of the Yakoun River.

One of the principal objects of our visit to Mount Ethelene was to seek for a pass through the mountains to the west coast.

Magnetic West a low pass was plainly visible and also the waters of Rennel's Sound. About one and one half miles to the west of us between Mount Ethelene and Rennel's Sound is Yakoun Lake, a beautiful sheet of water, about one mile in width and six miles in length. The slope from us was gentle to a valley, and then a rise of probably 400 feet, succeeded by a gradual fall to the lake.

Along the west shore, where the railway would have to run, the ground rises to a sloping range of hills. The timber on the property consists of yellow and red cedar, spruce, hemlock and alder. The alder and spruce are in the valleys, the cedar and hemlock on the side hills and higher elevations.

There is ample cedar and spruce for all buildings, coal bunkers, railway ties, and special mine timber necessary for utilization of the property. The hemlock, which is most abundant, is of magnificent growth, and well suited for ordinary mine timbers. There is no doubt but that the trees are of second growth, the first growth having fallen and rotted away, covering the surface with a mass of decayed vegetable matter to a depth of from two to four feet. Hence the absence of numerous rock exposures. All exposures visible are of the coal bearing sandstones.

The soil underneath the decayed vegetable matter is good but is best in the valleys of the different streams.

RAILWAY.

Having seen from Mt. Ethelene a pass to Rennel's Sound, also a valley from the divide, before mentioned, leading to tide water, at the mouth of the Honna, we (Mr. Robertson and myself) decided to explore the most practicable route for a Railway to this point.

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Coming east from Camp Robertson, a distance of about 1700 feet, the surface is level, then descends to the level of the Honna and Yakoun divide, an elevation of 275 feet above tide. Probably a tunnel would be driven to the west from near this point, striking all the beds found at Camp Robertson and thus working them from the water level.

If Skidegate Inlet be selected for a shipping point, the coal could be taken by Railway, about 7 miles to docks built on the south side of Lina Island. This is a good harbor, well sheltered in all weather, plenty water at low tide and good anchorage. From Camp Wilson a road could be built from the coal, down the creek, about $\frac{3}{4}$ mile to the Yakoun river, then up the Yakoun valley, a distance of about ten miles to the junction at the divide. There is only a rise of 75 feet in the entire distance.

From Camp Anthracite the road would follow down the creek to meet the Yakoun, thence down the Yakoun to the divide, a distance of about 3 miles. The entire length of railway would be about 21 miles, to work all the camps on the property. A railway could be built very cheaply, as there would be scarcely any rock work, and the road would be practically a surface road.

Line to the West Coast—The opinion Mr. Robertson and I have formed is that the best line for a road is to Rennel's Sound on the West Coast, because of its superior shipping advantages. This would pass around the north end and along the west shore of Yakoun Lake, to the beginning of the trail, as shewn on the plan, thence up the valley and along the side hills to make grade to the summit, an elevation of 600 feet above tide, then south west through Yakoun pass, down the big rock run to Yakoun bay, at the head of Rennel's Sound.

The total length of this road to take the coal from all camps on the property would be about 20 miles, costing about \$4,000 per mile, as it would be a surface road throughout. When at the summit, we saw two passes, one to the west, the other to the south-west.

Mr. Robertson explored the one to the west, and I took the other. They both led to Rennel's Sound, and entered the sound only a short distance apart. I returned by the one Mr. Robertson explored, and found it to be 150 feet higher than the other (Yakoun Pass).

After assuring ourselves that Yakoun Bay was a good harbor, we put a trail through from the summit, a distance of about two miles, and made an examination, the report of which follows :

RENNEL'S SOUND.

Yakoun Bay.—This bay, as you will see by the plan, is near the head of Rennel's Sound, which is a fine inlet running in from the Pacific Ocean. It is about 7 miles wide at its mouth, and at least 10 miles long.

Yakoun Bay is about two miles long and one mile in width a natural harbor; one of the best I have ever seen, plenty of water at all stages of the tide and completely land locked. The hills to north, south and east shelter it from winds off shore and Shields and Indian Islands with the mountains on the west protect it from storms drawing in from the ocean. At the south-east end is a knob, a natural place for docks, sufficient water at low tide for vessels to come in shore. Docks can be built at this point at a minimum cost large enough to do the trade of the coast. At the north end is a clear passage of about 8 miles or more to the ocean, with an entrance of about 7 miles wide between the high points at the mouth of Rennel's Sound. Vessels coming to this harbor have a clear run in from the ocean, and the moment they turn Shields Island are completely protected. They can load and turn the south end of Indian Island passing to the west of Shields Island and out into the sound. There is an abundance of fresh water at all seasons to supply all requirements.

The advantages I see for this as a ship point are many, but the chief one is that vessels from Pacific Coast points have a clear run up the ocean until they make the entrance and then a clear run

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into port, thus saving pilotage and towing charges. These charges will alone more than compensate owners of sailing vessels for the extra run; in fact they ought to carry freight for less per ton from Yakoun Bay, Rennel's Sound, to San Francisco, than from any other port in British Columbia or Puget Sound.

CONCLUSION.

With the knowledge I have of the coal regions of Pennsylvania, acquired there as a Mining Engineer, and on the geological staff of that State, it must gratify you to know that in my judgment you have the best coal field I have seen. Until I visited it I had no conception such a valuable field existed on the Pacific Coast. You possess a number of beds of unusual thickness, containing coals of superior quality, suitable for all requirements. You have anthracite, first-class steam, gas and coking coals, and a bed over 15 feet thick, excellent for domestic purposes. Your property has been judiciously acquired. It follows the strike of the measures north and south for over 11 miles. I have no doubt the beds will be found at or near the surface, from its south to north limits, and I will add, although I have before mentioned it in this report, practically undisturbed.

Yours, etc.,

H. E. PARRISH, C. E. and M. E.